

# INVESTIGATOR'S ANNUAL REPORT

## National Park Service

All or some of the information provided may be available to the public

<b>Reporting Year:</b> 2004	<b>Park:</b> Shenandoah NP
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<b>Permit#:</b> SHEN-2003-SCI-0004	
<b>Park-assigned Study Id. #:</b> SHEN-00133	
<b>Project Title:</b> GEOLOGIC EVOLUTION OF MESOPROTEROZOIC BASEMENT, BLUE RIDGE PROVINCE, SHENANDOAH NATIONAL PARK, VIRGINIA	
<b>Permit Start Date:</b> Mar 01, 2003	<b>Permit Expiration Date</b> Feb 28, 2004
<b>Study Start Date:</b> Jun 01, 1998	<b>Study End Date</b> Dec 31, 2015
<b>Study Status:</b> Continuing	
<b>Activity Type:</b> Research	
<b>Subject/Discipline:</b> Geology / General	
<b>Objectives:</b> <p>The primary objective of this study is the determination of detailed geologic, petrologic, and geochronologic relationships characterizing metamorphic and igneous basement rocks of Mesoproterozoic age exposed in the Blue Ridge geologic province within and adjacent to Shenandoah National Park. The project involves detailed field mapping and an integrated program of petrographic, geochemical, and isotopic analyses designed to elucidate the petrologic and temporal history of the Grenville orogeny. The geologic maps and data obtained as part of this investigation will provide a strong scientific basis for resource management and land-use decisions within both the National Park and surrounding areas.</p>	
<b>Findings and Status:</b> <p>During the past year, progress in this research project includes: (1) expanded field mapping and sampling of geologic units, (2) petrographic analysis of thin section samples, (3) major- and trace-element geochemical analyses of selected whole-rock samples, and (4) U-Pb isotopic analyses of zircons and monazites from eight of the mapped lithologic units. To date, field mapping, undertaken both within the Park and in contiguous adjoining areas, has elucidated the areal extent and mutual geologic relationships of basement rocks in the Chester Gap, Washington, Thornton Gap, Old Rag Mountain, Big Meadows, and Fletcher 7.5-minute quadrangles. During the past year, mapping and sampling efforts were concentrated on basement rocks located within the Bentonville and Washington quadrangles. In addition, we have coordinated efforts with another research group working in the nearby Madison quadrangle. The mapping throughout the entire area has demonstrated the existence of about twenty major lithologic units including different types of gneisses, charnockites, and leucocratic granitoids. Results from a comprehensive program of geochemical analyses of all rocks has led in the past year to discovery of a geologically important subset of granitoids (referred to as A-types) that were emplaced as magmas following major Grenvillian orogenesis in the area. The geochronologic data obtained to date, including analyses of eight additional lithologic units during the past year, has resulted in recognition of a series of geologic events in the area that collectively span an interval of at least 150 m.y. This detailed record of geologic activity, which collectively defines the Grenville orogeny in the northern Blue Ridge province, includes at least three periods of magmatism and a major period of deformation and metamorphism. These newly established relationships constitute the first detailed geochronologic calibration of Grenville-age orogenesis in the Virginia Blue Ridge based on integrated studies involving field, petrologic, and isotopic investigations. Such information is important to developing an increased understanding of Precambrian tectonics and the processes by which compressional mountains are</p>	

created. Moreover, this research is providing detailed mapping of rock distribution and compilation of both mineralogical and geochemical compositions throughout much of the Park and adjoining area. Such studies should provide a firm quantitative basis for understanding the heterogeneous nature of soil distribution. Such surficial information is, in turn, critical to understanding the effects of soil characteristics on plant ecology, as well as environmental concerns such as the buffering capabilities of soil and bedrock for both groundwater and surface runoff. Studies planned for 2005 include: (1) continued field mapping and petrographic analysis of rocks in the northern part of the study area, (2) major- and trace-element geochemical analyses of additional whole-rock samples and (3) U-Pb isotopic analyses of zircons from key lithologic units.

This research project has become part of a collaborative effort involving scientists from the U.S. Geological Survey and Virginia Division of Mineral Resources designed to produce multi-disciplinary resource maps for Shenandoah National Park. A major product from this research will be a new geologic map of the National Park and vicinity, supported by a wide array of modern field and analytical data.

**For this study, were one or more specimens collected and removed from the park but not destroyed during analyses?**

Yes

**Funding provided this reporting year by NPS:**

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**Funding provided this reporting year by other sources:**

19000

**Fill out the following ONLY IF the National Park Service supported this project in this reporting year by providing money to a university or college**

**Full name of college or university:**

n/a

**Annual funding provided by NPS to university or college this reporting year:**

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